A supply air terminal assembly

The invention relates to a supply air terminal assembly of the kind that is seen in the preamble of claim 1.

A type of ventilation duct networks well known from the practice for a building comprises a central air-treatment assembly, which, among other things, comprises a fan unit, which drives supply air through a pipe system, which branches into the rooms of the building, so that at least one supply air pipe mouths into each room to be ventilated. In order for the supply air flows into the different rooms to remain stable, even if the supply air flow into one or more individual rooms is increased or decreased, the supply air flows from the pipe system into the respective rooms has to be given a substantial pressure drop by means of a throttling unit. The pressure drop (the throttling unit) is usually established in a supply air terminal device, which is mounted in the respective room. The pressure drops in question, which in practice may be of the order of 100 Pa, produce an annoying noise in many types of supply air terminal devices.

However, the patent specification NO-307583 discloses a supply air terminal device that affords an expedient high pressure drop for the supply air, in combination with a very low noise generation. For this purpose, the supply air terminal device contains a throttling unit that may be formed of a filter material, which may be in the shape of a flexible bag, which with the neck thereof is connected to the end of the supply air pipe.

The Norwegian patent specification NO-33947 discloses a supply air terminal assembly for a room, of the kind that is seen in the preamble of claim 1. The supply air terminal assembly contains two separate throttling units of, for instance, the kind that is seen in NO-307583, one of the throttling units on the upstream side thereof having a valve that normally is closed but may be converted into an open position for the provision of an enhanced ventilation of the room. By the fact that the supply air terminal assembly is reset between two predetermined settings, the noise problems are avoided that otherwise are associated with a gradual distribution of the supply air flow between the two throttling units by means of a butterfly valve.

Another drawback in the previously known type of two-stage supply air terminal assemblies is that the throttling unit that constantly is flown through by supply air, separates particles such as dust from the supply air, wherein the same filter in the course of time gets an increasing degree of clogging, in particular if it consists of a filter bag or the like, whereby it gets a correspondingly reduced air throughflow or risk arises that separated/accumulated particles suddenly leave the assembly. In practice, this is normally compensated by the fact that the pressure of the fan assembly is gradually altered so that the air throughflow through the supply air terminal unit can be maintained within chosen limits. When the filters are regarded as clogged or consumed, all filters in the network are normally exchanged simultaneously, and the fan assembly is reset so that the supply air pressure returns to nominal level.

Since the second throttling unit of the known filter assembly, which unit only rarely is flown through by supply air during the short periods in question of forced ventilation by means of the assembly, this throttling unit gets a much lower load of dust and particles than the other throttling unit. Therefore, if the valve in a supply air assembly is opened after a longer period of operation of the ventilation duct network, the air throughflow through the throttling unit not normally being flown through by supply air will become clearly enhanced, in relation to the air throughflow through the filter being permanently flown through by air. A drawback of the previously known supply air terminal assembly is that it requires relatively large space, since it comprises two separate exposed air units.

Therefore, an object of the invention is to entirely or partly obviate the above-mentioned drawbacks that are associated with two-stage supply air terminal assemblies of the kind accounted for above.

The object is attained by the invention.

The invention is defined in the appended independent claim.

Embodiments of the invention are defined in the appended dependent claims.

Thus, an important feature of the invention is that the two throttling units of the assembly normally are connected in series, so that they both are flown through by

supply air in the normal operation state of the assembly. The supply air that arrives from the pipe system contains particles and dust that deposit in the throttling unit located upstream, especially when the same is in the form of a filter, but it has also turned out that the throttling unit located upstream, even when it is in the form of a filter, lets through a considerable portion of the particles of the supply air, so that also the throttling unit located downstream separates and receives a substantial portion of the particles in the supply air supplied to the assembly. This results in the two throttling units of the assembly in practice receiving similar particle loads, and this causes the two throttling units to receive similar enhancements of the respective flow resistances thereof. Then, after a longer operating period and after raising of the flow pressure of the fan assembly, when the valve of the supply air terminal assembly is opened for the establishment of a temporary enhanced ventilation in the room, the supply air will only pass one, the first throttling unit, that in the normal state of the assembly is located downstream the second throttling unit. The first throttling unit may be in the form of a filter bag that is suitably formed and dimensioned in order to lead through the predetermined enhanced flow. When the valve is closed, the pressure drop over the second throttling unit becomes small. The normal flow through the supply air terminal assembly is adjusted by the choice of suitable sizes, shapes and dimensions of the two throttling units as connected in series.

In particularly preferred embodiments of the invention, the throttling units are composed of filters in the form of bags, the assembly being formed so that one of the bags is inserted in the other one, so that a ring-like gap is present between the bag necks, the valve being arranged to cover and uncover, respectively, the ring gap in order to prevent and allow, respectively, direct inflow of supply air through the outer one of the bags.

In preferred embodiments, the supply air pipe is circular cylindrical and carries the outer bag, a pipe socket arranged axially therein carrying the neck of the inner bag, and a valve plate having circular concentric inner and outer edges being arranged to uncover and screen off, respectively, the ring gap between the bag necks. In that connection, the valve plate should be parallel-displaced into and from the screening position. Alternatively, the valve plate may be diametrically divided, the parts being turnably mounted around axes located nearby and parallel to the dividing plane.

An actuating device has been arranged to actuate the parts closer to the dividing plane in order to produce a synchronous turning of the parts toward and away from each other. In a simple case, the actuating device may be formed of a stationary bar of a material having high thermal expansion and that is heated in order to get an increased length by the fact that the freely movable end thereof can turn the ring halves from the normal position thereof, and possibly also back into the normal position after cooling. Possibly, the ring halves of the valve may be spring prestressed towards the normal position.

In the following, the invention will be described in the form of examples, reference being made to the appended drawing.

Fig. 1 shows schematically a supply air terminal assembly according to the invention in axial section.

Fig. 2 shows a section taken along line II–II in fig. 1.

Fig. 3 shows a modified embodiment of the assembly, in a depiction corresponding to fig. 2.

Fig. 4 shows schematically a view taken along line IV–IV in fig. 3.

Fig. 1 illustrates a room 1, which is supplied with supply air via a supply air terminal assembly 2, which is connected to the end of a supply air pipe 3, which extends up to the room 1. The pipe 3 is in turn branched off from a supply air duct 4, which conveys supply air having a pressure that is, for instance, 100 Pa higher than the air pressure in the room 1. The assembly 2 comprises two pipe sockets 21, 22, which are arranged substantially concentrically to each other. The outer socket 21 carries a bag 31 and the inner socket 22 a bag 32, which with the necks thereof are closely connected to the respective socket. The bags 31, 32 consist of filter material. A ring-shaped valve plate 40 screens off the ring gap between the sockets 21, 22, so that supply air can flow in through the pipe 3 and the opening 41 of the valve plate 40, into the bag 32 and out into the room 1, first through the wall of the bag 3 and then through the wall of the bag 31, as is shown by the arrow A. If the valve plate is retracted into the position 40', which is shown by dashed lines in fig. 1, also the ring gap between the pipe sockets 21, 22 is uncovered, so that the supply air that is led into the pipe 3 also can flow in

between the sockets 21, 22 and from there out through the wall of the outer bag 31, as is indicated by the arrow B.

An actuating device 44 is shown suspended on the piping 3 by means of supporting arms 48, and has an element 45 that is displaceable toward and away from the sockets 21, 22, and which via a transmission, for instance a connecting element 46, is connected to the ring plate 40 in order to move the same between the two indicated positions.

The actuating device 44 may be electrically driven.

In the embodiment according to fig. 3, an alternative embodiment of the valve plate 40 is shown, which in this case is centrally divided into two parts 41. At a distance s from the dividing plane P, the parts 41 are mounted in, for instance, the wall of the pipe 3 to be turnable around axes that are parallel to the dividing plane P and located in the plane of the valve plate 40. The actuating device 44 is shown to be of a linearly actuatable type and connects to the parts 41 via a motion gearing transmission, which comprises a bar 45 that can actuate the parts 41 in positions located closer to the plane P than the turning bearings 48 of the parts 41. In that connection, the bar 45, which suitably is movable towards and from a plane defined by the bearings 48, and which may be located in the plane P, may be linked to the parts 41 in positions 47, which are located closer to the plane P than the bearings 48. In that connection, in the end thereof the bar 45 may be turnably mounted to two link arms, which in turn are turnably mounted to the points 47. Alternatively, the bar 45 may act directly against the parts 41 near the plane P.

A simplified transmission may be composed of a bar 45, one end of which is fixedly mounted and the second end 46 of which acts directly or indirectly against the parts 41 so as to turn the same into and from lowered position, wherein the bar 45 may be composed of a material having a high thermal expansion coefficient, so that the end 46 thereof can be displaced to a requisite extent only by heating the bar 41, for instance by a resistive heater. Since supply air flows through the pipe 3, the bar 45 will be cooled quickly by the passing air flow after the heating.